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Box PATENT APPLICATION

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Sir:

Transmitted herewith for filing is the patent application of

INVENTOR OR APPLICATION IDENTIFIER: Yong-Seok PARK

FOR: METHOD FOR CHANGING CHANNEL INFORMATION IN DIGITAL TV RECEIVER

Enclosed are:

1. [X] 13 pages of specification, claims, abstract
2. [X] 9 sheets of FORMAL drawing.
3. [X] 2 pages of newly executed Declaration & Power of Attorney (original).
4. [X] Priority Claimed.
5. [ ] Small Entity Statement.
6. [ ] Information Disclosure Statement, Form PTO-1449 and reference.
10. [X] Authorization under 37 C.F.R. §1.136(a)(3).
11. [ ] Other:

7. [X] Assignment Papers for LG Electronics Inc. (cover sheet, assignment & assignment fee).
8. [X] Certified copy of Korean Patent Application No. 17614/1998 filed May 15, 1998.
9. [X] Two (2) return postcards.
- [X] Stamp & Return with Courier.
- [X] Prepaid Postcard-Stamped Filing Date & Returned with Unofficial Serial Number.

Case Docket No.:K-089

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CLAIMS AS FILED					
For	No. Filed		No. Extra	Rate	Fee
Total Claims	8	- 20	0	X \$18.00	\$0.00
Indep. Claims	1	- 3	0	X \$78.00	\$0.00
Multiple Dependent Claims (If applicable)				X \$260.00	\$0.00
BASIC FEE					\$760.00
TOTAL FILING FEE					\$760.00

- [ ] This is a Continuation-in-part (CIP) of prior application No: \_\_\_\_\_ filed \_\_\_\_\_. Incorporation By Reference-The entire disclosure of the prior application is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

- [ ] Amend the specification by inserting before the first line the sentence:

--This application is a continuation-in-part of Application Serial No. \_\_\_\_\_ filed \_\_\_\_\_.--

- [X] A check in the amount of \$760.00 (Check #7153) is attached.

- [ ] Please charge my Deposit Account No. 16-0607 in the amount of \$\_. A duplicate copy of this sheet is enclosed.

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- [X] Any filing fees under 37 C.F.R. 1.16 for presentation of extra claims.

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[illegible]

## BACKGROUND OF THE INVENTION

### Field of the Invention

The present invention relates to a digital TV receiver, and more particularly, to a method for changing channel information in a digital TV receiver.

### Background of the Related Art

Recently, keeping pace with development on TV technologies, there has been growing interests in digital TV receivers having a digital transmission system applied thereto, and, in a domestic case, the Mugungwha satellite was launched and started digital test broadcasting in July '96. In general, a time multiplexed signal of video, audio and program specific information signals intended to transmit in a digital satellite broadcasting is called as a transport stream(TS), which is QPSK modulated before transmission to respective receivers through a satellite.

Referring to Fig. 1, in detail, the information multiplexed to TS has an elementary stream of which main purpose is broadcasting, and a RSMS(Resource & Subscriber Management System) stream, a program specific information. The elementary stream is inclusive of video information, and audio information the same as the analog broadcasting, and data additional in a case of the digital broadcasting. The RSMS stream has SI(Service Information) and RSMS message, of which RSMS message is transmitted in a case when a conditional access function is used, and the SI has PSI(Program Specific Information) which allows a receiver to demultiplex the TS and PMM(Program Guide Message). The PSI, which is an objective of the present invention, has PAT(Program Association Table), PMT(Program Map Table) and CAT (Conditional Access Table).

Fig. 2 illustrates a PSI table, wherein the PAT provides PIDs(Packet IDs) of the PMT connecting program numbers which is information on a service stream provided presently, i.e.,

information on assignment of channels to repeaters to the elementary stream having video and audio information for each program number, and PIDs of the PMM and the RCM in the RSMS stream. The PMT provides a program definition by connecting the program number to one set of elementary stream. One section of the PMT defines one program.

5           The PAT and PMT have architectures as shown in Figs. 3a and 3b respectively. The PAT has a data pattern inclusive of a version number which is increased as a number of PMT sections is increased and decreased as the number of PMT sections is decreased, i.e., broadcasting channel changes in correspondence to the PMT section. A related art digital TV receiver conducts PAT and PMT parsing only when an initial power is turned on for re-setting channel information and, maintains broadcasting channel information set initially until turning on after turning off the power. Because the related art digital TV receiver maintains a channel set at initial power supply as it is during watching a broadcasting, the related art digital TV receiver has a problem in that a channel having no display of video can not be canceled or a channel added newly can not be displayed even if channel information is changed due to channel cancellation/addition during  
10  
15 broadcasting, that gives inconvenience to users.

### SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a method for changing channel information in a digital TV receiver that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

20           An object of the present invention is to provide a method for changing channel information in a digital TV receiver which can deal with a channel cancellation/addition during broadcasting.

Additional features and advantages of the invention will be set forth in the description

which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

5 To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, the method for changing channel information in a digital TV receiver includes the steps of (1) determining a channel information of being changed from a broadcasting signal received at every preset time interval and storing the changed channel information, and (2) comparing the stored changed channel information and channel information stored already, for updating the channel information.

10 It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

#### BRIEF DESCRIPTION OF THE DRAWINGS

15 The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention:

In the drawings:

20 Fig. 1 illustrates an architecture of a related art transport stream;

Fig. 2 illustrate an architecture of the PSI table in Fig. 1;

Figs. 3a and 3b illustrates architectures of the PAT and the PMT in Fig. 2, respectively;

Fig. 4 illustrates flow chart showing the steps of a method for parsing a PAT in changing

channel information in a digital TV receiver in accordance with a preferred embodiment of the present invention;

Fig. 5 illustrates flow chart showing the steps of a method for parsing a PMT in changing channel information in a digital TV receiver in accordance with a preferred embodiment of the present invention;

Figs. 6a and 6b explain a method for checking canceled/added channel in Fig. 5;

Fig. 7 illustrates an embodiment of algorithm for conducting the checking of canceled /added channel in Fig. 5; and,

Fig. 8 illustrates an embodiment of algorithm for adjusting the channel list in Fig. 6a.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Fig. 4 illustrates flow chart showing the steps of a method for parsing a PAT in changing channel information in a digital TV receiver in accordance with a preferred embodiment of the present invention, Fig. 5 illustrates flow chart showing the steps of a method for parsing a PMT in changing channel information in a digital TV receiver in accordance with a preferred embodiment of the present invention, Figs. 6a and 6b explain a method for checking canceled/added channel in Fig. 5, Fig. 7 illustrates an embodiment of algorithm for conducting the checking of canceled /added channel in Fig. 5, and Fig. 8 illustrates an embodiment of algorithm for adjusting the channel list in Fig. 6a.

The method for changing channel information in a digital TV receiver of the present invention is achieved by parsing PAT and PMT in the PSI information, which will be explained with reference to Fig. 4, because a version number in the PAT information is a criteria of a

channel information change.

The method for changing channel information in a digital TV receiver of the present invention starts with demultiplexing a received transport stream at fixed intervals and extracting PATs therefrom(S101). Then, a version number is detected from the extracted PAT(S102), and it is determined whether the version number is changed or not(S103). If it is found that the version number is changed as a result of the determination(S103), it is determined whether the repeater is switched or not(S104). And, if the repeater is not switched, it is determined that the version number change is come from channel information change. In this instance, if each repeater has its own transmission station, a new parsing is not required in a case a version change is caused by the switch of the repeater because there are cases when the version number change come from difficulty in matching versions caused by different situation of the transmission station even if contents of the SI(Service Information) are identical. For example, in the case of Korean Mugungwha satellite, even if version numbers of the Mokdong transmission station and the Yongin transmission station are different, the SI information is the same. Therefore, as a result of the determination (S104), if it is found that the repeater is not switched, which implies that the SI is changed, the version number change is determined to be an actual channel information change, the changed version number is stored, and a PAT parsing is started(S105). Then, the PAT parsing conducted presently is determined of being an initial parsing(S106). As a result of the determination(S106), if it is found that the PAT parsing conducted presently is the initial PAT parsing, each channel information is detected, stored in First\_DB, and forms EPG\_First(S107). The First\_DB is a memory for providing a data base of the initial PAT parsing channel information, and the EPG\_First is a memory for storing a channel architecture, both are named by the inventor. As a result of the determination(S106), if it is found that the PAT parsing

conducted presently is not the initial PAT parsing, the initial EPG\_First is cleared(S108), each channel information of the change version is detected, stored in Changed\_DB, and forms EPG\_Changed(S109). In this instance, the Changed\_DB is a memory for providing a data base of the change channel information after the First\_DB, and the EPG\_Changed is a memory for storing change channel architecture after the EPG\_First, which is name by the inventor. The subroutine(S107) or the subroutine(S109) is conducted, and a PMT start command is provided upon completion of the PAT parsing(S110). Then, the process stands by for reception of a PMT parsing completion signal, to return to the initial subroutine(S111).

A process of the PMT parsing will be explained with reference to Fig. 5.

Upon completion of the PAT parsing, the process stands by for reception of a PMT start command(S201). Upon reception of the PMT parsing start command, it is determined if the PMT parsing is an initial PMT parsing(S202). If it is found that the PMT parsing is the initial PMT parsing, PMT information is stored in the First\_DB(S203), and a PMM information processing command is provided for providing a program specific information to a user(S204). Upon completion of the PMT parsing, a PMT parsing completion signal is provided(S207). If it is found that the PMT parsing is not the initial PMT parsing, as a result of the determination (S202), new PMT information is stored in Changed\_DB, and EPG\_First and EPG\_Changed are compared, to check actually canceled or added channel(S205), and channel information update is executed, and the channel update is waited(S206).

Detail operation of the channel checking and updating will be explained.

The channel check is conducted by comparing EPG\_First and EPG\_Changed as shown in Fig. 6a, and setting a pertinent memory in In\_ch to '1' if there is an added channel and setting a pertinent memory in Del\_ch to '1' if there is a canceled channel as shown in Fig. 6b, with a



channel check algorithm shown in Fig. 7 applied thereto as one embodiment of the present invention. Upon completion of the channel check, channel update is conducted. In order to form a new channel connection architecture, the data base is re-arranged, and the data base is stored in EPG\_First for being prepared for another channel change. And, because, in order to conduct the channel update, synchronization between independent processors should be matched for stabilizing a signal reception state, the channel update is conducted according to one embodiment of a channel connection architecture re-arrangement algorithm as shown in Fig. 8, for disconnecting connection to a canceled channel and connecting to an added channel, thereby updating channels. Upon completion of the channel update(S206), a PMT parsing completion signal is provided(S207).

Key points of the channel connection architecture re-arrangement algorithm are as follows.

First, upon completion of the channel cancellation or an additional check, a link structure is changed.

Second, no data base re-arrangement should be made, in which the link structure is changed, during an EIT parsing.

Third, no DB re-arrangement should be made during an Event Delete process proceeds, in which program is re-arranged at one hour intervals.

Fourth, the data base should be re-arranged when a channel watched presently is not included in canceled channels.

Thus, when the PMT parsing completion signal is provided upon completion of the PMT parsing, the PAT parsing at standby is started again to proceed the PAT parsing, to conduct the PAT and PMT parsing, thereby conducting a channel information change.

The method for changing channel information in a digital TV receiver of the present invention has the following advantages.

First, the conduction of PAT and PMT parsing based on channel information change known from version number and repeater switch reduces additional load on the controller, and  
5 the constant provision of a stable broadcasting program to users in response to channel information change possible to occur during broadcasting improves a reliability.

Second, the re-arrangement of channel connection architecture while matching synchronization between multi-processors facilitates stabilization of a system reception state.

It will be apparent to those skilled in the art that various modifications and variations can  
10 be made in the method for changing channel information in a digital TV receiver of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is Claimed is:

1. A method for changing channel information in a digital TV receiver, the method comprising the steps of:

(1) determining a channel information of being changed from a broadcasting signal received at every preset time interval and storing the changed channel information; and,

(2) comparing the stored changed channel information and channel information stored already, for updating the channel information.

2. A method as claimed in claim 1, wherein the step (1) includes the step of determining a version of the received broadcasting signal of being changed.

3. A method as claimed in claim 2, wherein the step of determining a version change of the received broadcasting signal includes the steps of;

parsing PAT information from a transport stream, and

checking a version number in the parsed PAT information to determine the version change.

4. A method as claimed in claim 1, further comprising the step of determining a repeater of being switched if it is found that the channel information is changed, to store the changed channel information.

5. A method as claimed in claim 4, wherein the step of determining a repeater of being switched includes the steps of:

storing the changed channel information if it is found that the repeater is not changed, and maintaining existing channel information if it is found that the repeater is changed.

6. A method as claimed in claim 1, wherein the step of storing the changed information includes the steps of;

5 starting a PAT parsing,

determining the PAT parsing conducted presently of being an initial PAT parsing,

storing each channel information in a first data base to form a first channel list, if it is found that the PAT parsing is the initial PAT parsing as a result of the determination, and

clearing the first channel list, and storing the changed channel information in a second data base, to form a second channel list, if it is found that the PAT parsing is not the initial PAT parsing as a result of the determination.

7. A method as claimed in claim 1, wherein the step (1) includes the steps of;

providing a PMT parsing start command upon completion of the PAT parsing,

determining the PMT parsing conducted presently of being an initial PMT parsing,

15 storing PMT information in a first data base, and providing a PMT completion signal, if it is found that the PMT parsing conducted presently is the initial PMT parsing as a result of the determination,

if it is found that the PMT parsing conducted presently is not the initial PMT parsing as a result of the determination, storing the changed PMT information in a second data base, comparing a first channel list and a second channel list, to check added or canceled channel, 20 updating the channel information upon completion of the channel check, and providing a PMT

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## ABSTRACT

Method for changing channel information in a digital TV receiver which can deal with a channel cancellation/addition during broadcasting, including the steps of (1) determining a channel information of being changed from a broadcasting signal received at every preset time interval and storing the changed channel information, and (2) comparing the stored changed channel information and channel information stored already, for updating the channel information.

5

FIG.1  
Related Art

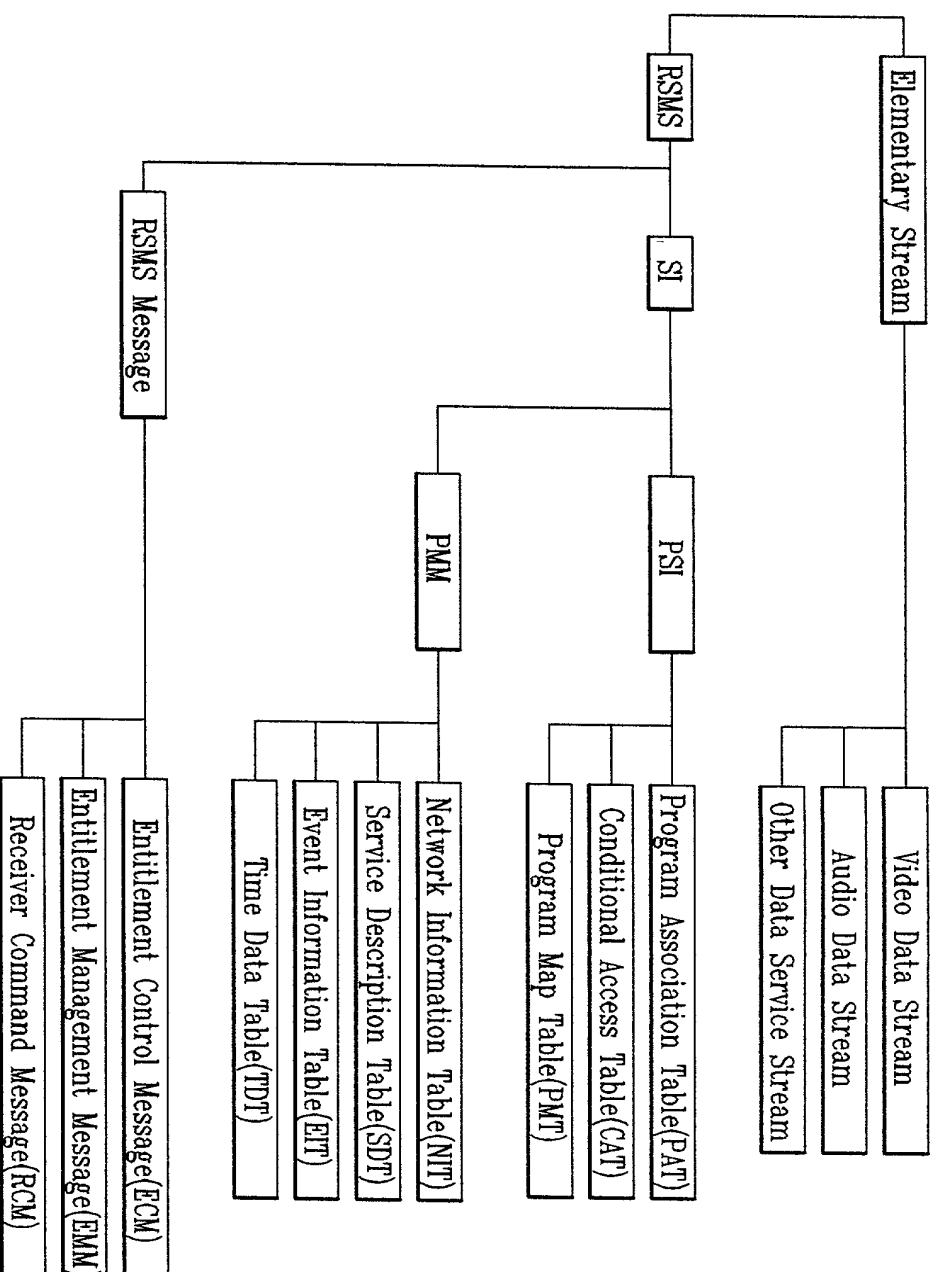


FIG.2  
Related Art

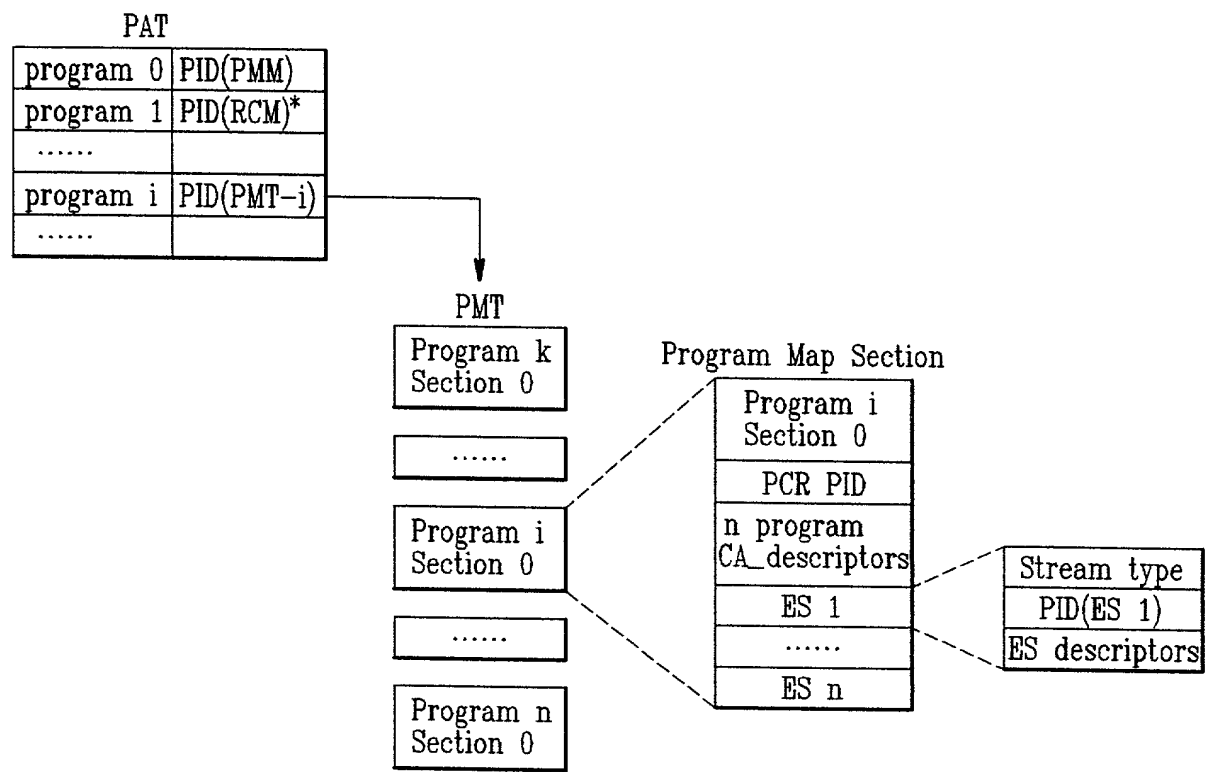




FIG.3A  
Related Art

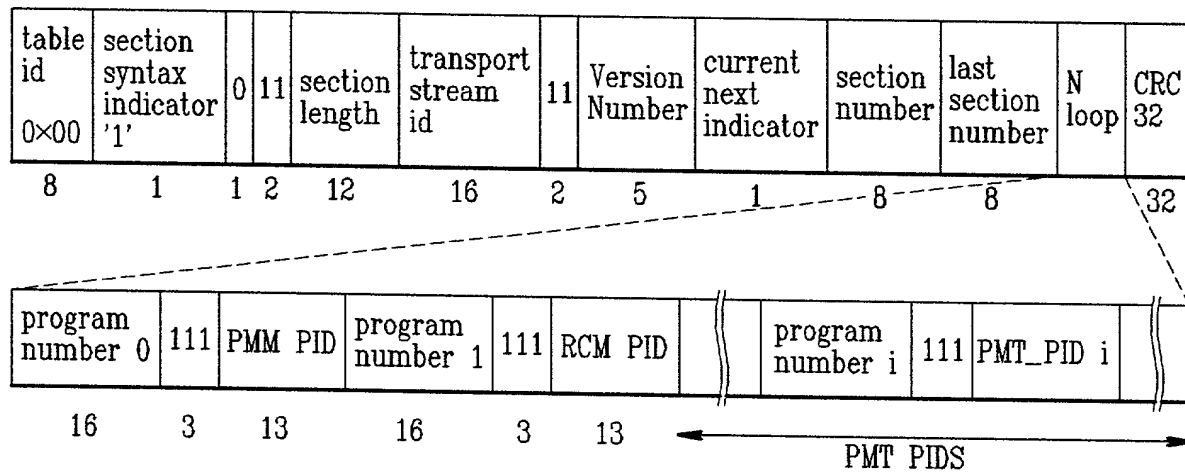


FIG. 3B  
Related Art

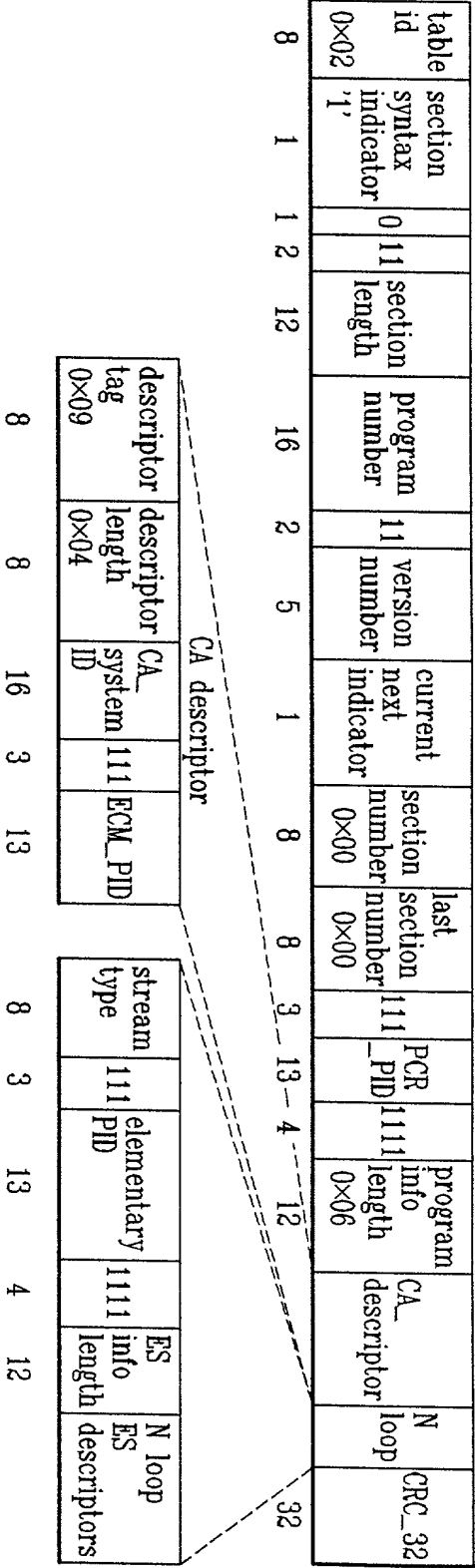


FIG.4

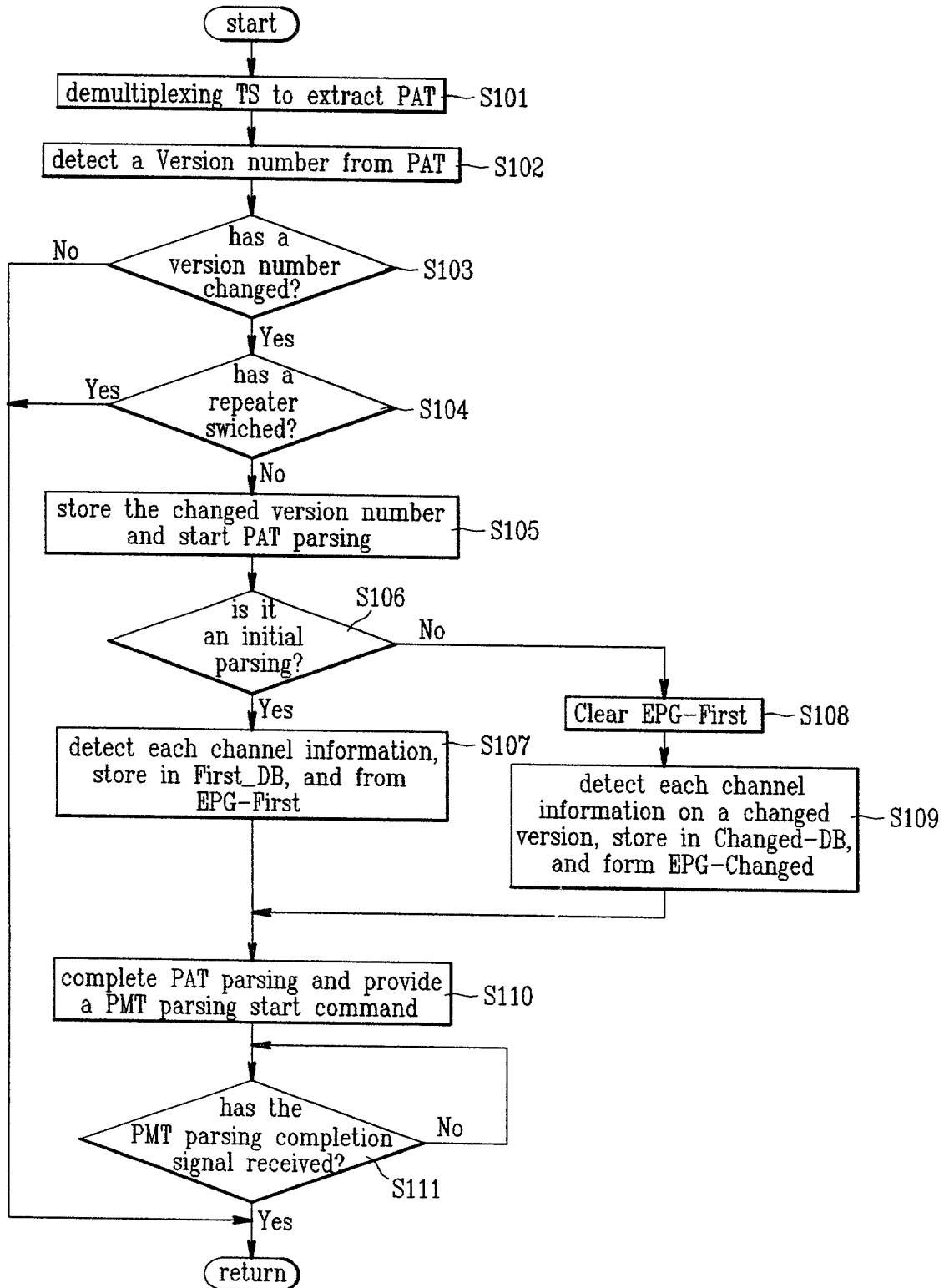


FIG.5

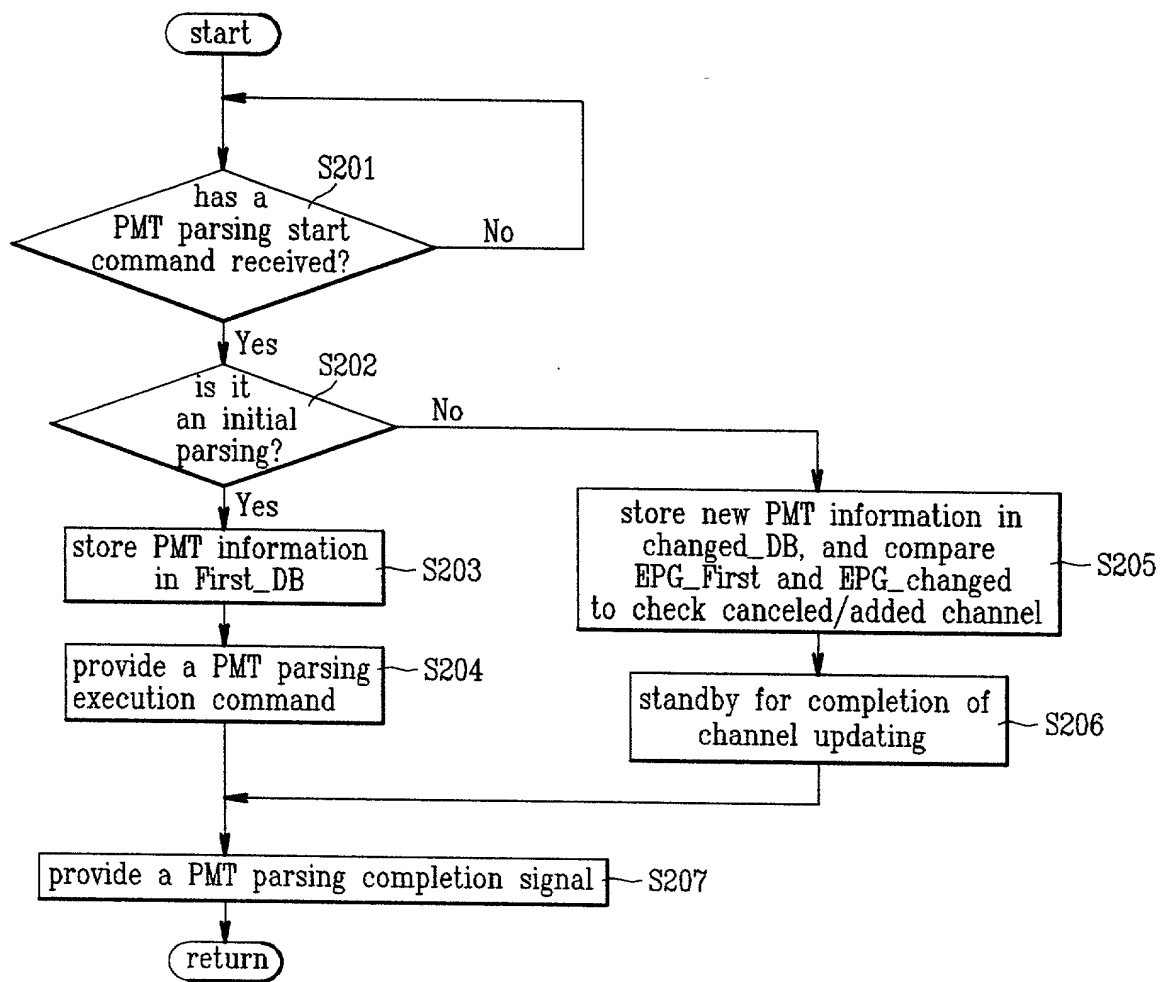


FIG.6A

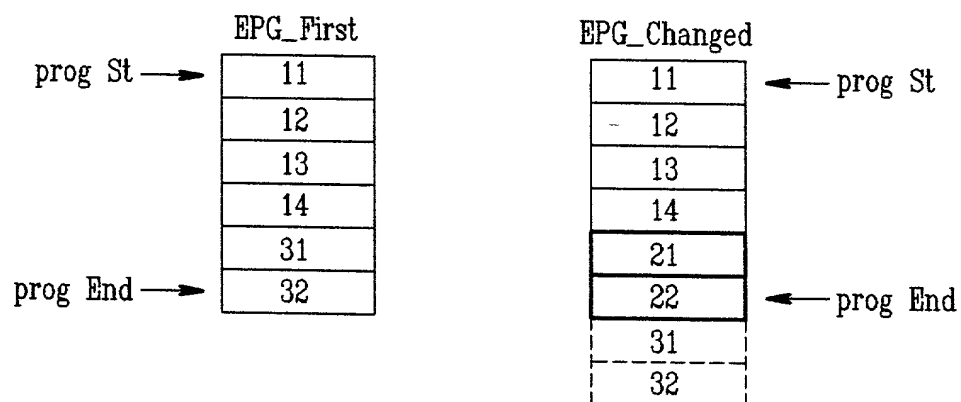


FIG.6B

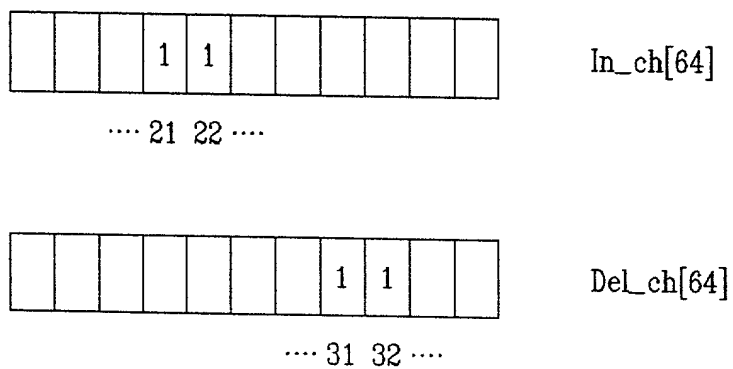


FIG. 7

```

PROGRAM *progCur *buf_progCut;

progCur =EPG_First-> progSt; /*designate a start channel in EPG_First as progCur */
while( progCur !=NULL ) } /* check channel cancel*/
buf_progCur = EPG_Changed->progSt; /* designate a start channel in EPG_Channel as buf_progCur */
while( buf_progCur != NULL ) {
    if( progCur->progNum == buf_progCur->progNum )
        break; /* no channel information change */
    buf_progCur = buf_progCur->progNext;
}
if(buf_progCur == NULL)
    Del_Ch[progCur->ch_no] = 1; /* setting canceled channel to '1' */
progCur = progCur->progNext;
}

buf_progCur = EPG_Changed->progSt; /* designate a start channel in EPG_Changed as buf_progCur */
while( buf_progCur !=NULL ) } /* check addition of channel */
progCur = EPG_First->progSt; /* designate a start channel in EPG_First as progCur */
while(progCur != NULL) {
    if( buf_progCur->progNum == progCur->progNum )
        break; /* no channel information change */
    progCur = progCur->progNext;
}
if(progCur == NULL)
    In_Ch[buf_progCur->ch_no] = 1; /*check addition of channel*/
buf_progCur = buf_progCur->progNext;
}
Ver_Ch_pat_pmt = TRUE;
/* a FLAG informing to a key handling process that channel
cancelation and addition checks are finished */

```

FIG.8

```
switch( key )
{
case HOT_KEY and channel UP, DOWN KEY:
    /* taking action required by a key input */
    break;

default: /* a motion picture without key input */
    if(Ver_Ch_pat_pmt && !evt_del_mode && !Del_Ch[curProg->ch_no] && !EIT_ON)
    { /* re-anrange DB when 4 conditions are satisfied */

        disconnect connection to a canceled channel and connect to an added channel;

        SemSignal(done_update_ch);
        /* as channel information updated, teturn to version chack process */
    }
    break;
}
```

Docket No.: \_\_\_\_\_

**DECLARATION AND POWER OF ATTORNEY**

As a below named inventor, I hereby declare that:

My residence, post office and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter claimed and for which a patent is sought on the invention entitled \_\_\_\_\_

**METHOD FOR CHANGING CHANNEL INFORMATION IN DIGITAL TV RECEIVER**

\_\_\_\_\_ the specification of which

[ X ] is attached hereto    [ ] was filed on \_\_\_\_\_ as Application Serial No. \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is known to me to be material to patentability in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim foreign priority or provisional application benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate, or provisional application(s) listed below and have also identified below any foreign application for patent or inventor's certificate, or provisional application(s) having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s) or U.S. Provisional Application(s):			Priority Claimed	
<u>Number</u>	<u>Country</u>	<u>Day/Month/Year</u>	<u>Yes</u>	<u>No</u>
17614/1998	Korea	15/May/1998	X	

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Prior U. S. Application(s):		<u>Status: Patented, Pending, Abandoned</u>
<u>Serial No.</u>	<u>Filing Date</u>	



I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

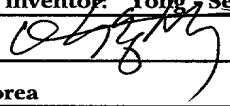
I hereby appoint the following attorney(s) and/or agent(s): Daniel Y.J. Kim, Registration No. 36,186 and Mark L. Fleshner, Registration No. 34,596; Carl R. Wesolowski, Registration No. 40,372, John C. Eisenhart, Registration No. 38,128, Rene A. Vasquez, Registration No. 36,647, all of

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With full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and all future correspondence should be addressed to them.

\*\*\*\*\*

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Inventor's signature: \_\_\_\_\_ Date: \_\_\_\_\_

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Citizenship: \_\_\_\_\_

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Inventor's signature: \_\_\_\_\_ Date: \_\_\_\_\_

Residence: \_\_\_\_\_

Citizenship: \_\_\_\_\_

Post Office Address: \_\_\_\_\_

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and